The Sun’s interior

Means of support: hydrostatic equilibrium (Figure 10.1)

- Gravity pulls all Sun’s material toward its center
- Gas exerts net outward pressure
• Pressure depends on
  – Density of gas
  – Temperature of gas

• The deeper into the Sun, the more pressure needed to bear the weight of overlying layers. Therefore, gas temperature and density both increase toward the center.

• Implied conditions at the Sun’s center
  – Temperature 15 million Kelvin
  – Density 150 grams per cubic centimeter (material is gas because of high temperature)
In addition to hydrostatic equilibrium, Sun maintains *thermal equilibrium*.

- Because the Sun is hot, it radiates energy to space.
- Because energy can’t be created, it must be coming from somewhere—that is, being converted from some other form.
- Thermal equilibrium means: amount lost to space = amount converted.
The proton-proton chain occurs only near the center of the Sun (and stars) because it requires

- High temperature (speed of protons) — about 15 million Kelvin

- High density so that protons collide often — roughly 100 grams per cubic centimeter